Quality Assurance Acceptance Testing and Inspection for PermaNet®

FAO/WHO/CIPAC
Dublin June 2012

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Start with why?

"The aim of procurement is to secure the best value for money for **quality-assured products**, to ensure the reliability of suppliers in terms of both quality and service"

LNs - Product Features → LNs - Product Specification(s) → Standard test method & Inspection method → Sampling scheme Go / No Go

WHO Guidelines for Procuring Public Health Pesticides, 2012

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Product Features - LNs

1. Protect against insect / vector entry
2. Be strong and durable
3. Keep its dimension after washing
4. Be safe to the users
5. Insecticide-treated properly for long lasting effectiveness
6. To be liked by the end-users, so they use it

Technical Consultation on specifications and quality control of netting materials and mosquitoes net – WHO 2005

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Product Specification(s)

WHO specification

- Active ingredient content
- Release / Retention Index
- Mesh count
- Bursting strength
- Dimensional Stability to washing
- Storage Stability
  Accelerated test

Other guidelines / standards (non exhaustive list)

- Size of the net
- Weight (g/m^2)
- Free-azo dyestuffs & Color fastness to washing/rubbing/light
- Flammability
- **Workmanship and Appearance**
- Other durability indicators (Slow nail test, tear strength, abrasion fastness…etc)
- Storage Stability / Product Shelf life
  FINAL

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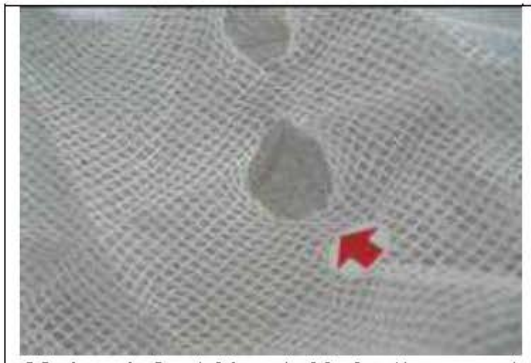
Workmanship & Appearance – *1. Description …shall appear clean..free from visible matter and visible manufacturing defects…(WHO specification of LN)*



Major defect No. 1: **Hole** (tear, cuts or bursts in the netting fabric with size bigger than 2x2 mesh or 0.5x0.5 cm whichever is bigger)


Minor Defect No.9 **Trimming defect.**
- Untrimmed thread ends of longer than 5cm
- Raw or uncovered seams with height of 1cm or above





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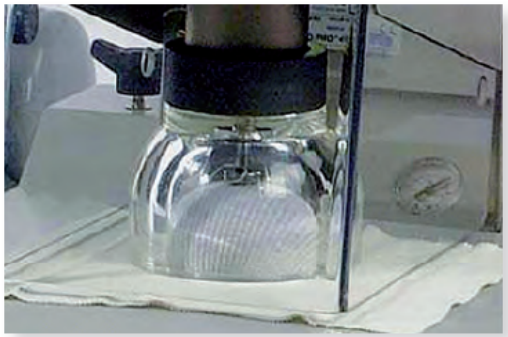
Measure the right indicators, and measure them well

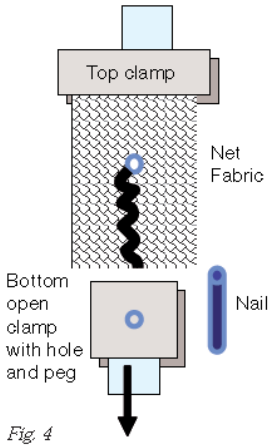
Items	Bursting Strength (kPa)	Mesh count (holes/inch2)
100 D netting – Specification	>= 350	>= 156
Netting – Conventional	380 *(360-432)*	169
Netting – New Machine	435 *(430-440)*	280

Close up view of a bursting test



THE TEST FABRIC STRETCHED over a pneumatic rubber diaphragm inside the pressure chamber. *Fig. 2*

Slow nail test



A NAIL INSERTED through a hole in the bottom clamp of a universal tensile tester pokes through the net fabric (blue circles). The bottom clamp is pulled down, and the required force and sequential resistance to tear is measured as a series of peaks and troughs (depicted by black squiggly line).

Fig. 4

Photos: Courtesy of Bayer CropScience

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Measure the right indicators, and measure them well

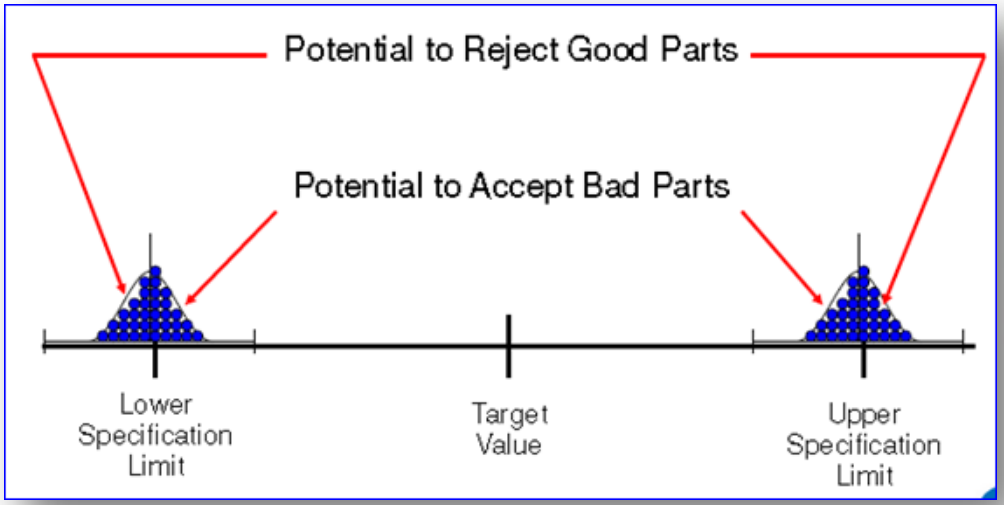
- Precision to Tolerance Ratio is the ratio of the precision of the measuring system to the allowed tolerance:

$$P/T = 6 \times \frac{\sigma_{measurement}}{USL - LSL}$$

  - » *USL: Upper Specification Limit*
  - » *LSL: Lower Specification Limit*

- A measure of whether a measurement system / a test method can discriminate between acceptable and unacceptable items. Highest Goal is to maintain **P/T below 0.1.** Secondary Goal is to maintain **P/T below 0.3.** P/T **over 0.5** indicates ineffective measurement systems

The higher the P/T Ratio, the more producer and consumer loses



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Well measurement?

Deltamethrin content Requirement & CIPAC 333/LN test method	
Tolerance (in mg/m2)	41.25-68.75
LSL (in mg/m2)	41.25
USL (in mg/m2)	68.75
Sigma of measurement (in mg/m2)	0.6
P/T ratio	**0.13**

Retention Index RI 01 Requirement & RI01 test	
Tolerance	min. 85%
LSL	85%
USL	100%
Precision of the measurement (repeatability)	3.4%
P/T ratio	**1.36**

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ISO 2859 series and ISO 3951 series

ISO 2859-1:1999 series

Sampling procedures for inspection by <u>attributes</u> –

ISO 3951-1:2005 series

Sampling procedures for inspection by <u>variables</u> –

Equivalent national standards:

ANSI/ASQC Z1.4 or Z1.9, NF06-022, BS 6001, DIN 40080; Military Standard 105E

These standards provides guidance on sampling plan, i.e., ***number of samples*** taken with ***acceptability criteria*** and sampling scheme, i.e., ***sampling plans*** with ***switching rules***.

(Introduction to Statistical Quality Control, 4th Edition)

ISO 2859 / 3951 sampling plan with acceptability criteria

SINGLE SAMPLING PLAN FOR NORMAL INSPECTION							
SAMPLE SIZE CODE LETTERS							
Lot Size	General Inspection Levels			Special Inspection Levels			
	I	II	III	S1	S2	S3	S4
2 to 8	A	A	B	A	A	A	A
9 to 15	A	B	C	A	A	A	A
16 to 25	B	C	D	A	A	B	B
26 to 50	C	D	E	A	B	B	C
51 to 90	C	E	F	B	B	C	C
91 to 150	D	F	G	B	B	C	D
151 to 280	E	G	H	B	C	D	E
285 to 500	F	H	J	B	C	D	E
501 to 1200	G	J	K	C	C	E	F
1201 to 3200	H	K	L	C	D	E	G
3201 to 10000	J	L	M	C	D	F	G
10001 to 35000	K	M	N	C	D	F	H
35001 to 150000	L	N	P	D	E	G	J
150001 to 500000	M	P	Q	D	E	G	J
500001 and over	N	Q	R	D	E	H	K

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Acceptance Quality Levels (Normal Inspection)

Sample Size Code Letter	Sample Size	0		0.1		0.15		0.25		0.4		0.65		1		1.5		2.5		4		6.5	
		Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re
A	2																					0	1
B	3																			0	1		
C	5																	0	1				
D	8															0	1					1	2
E	13													0	1					1	2	2	3
F	20											0	1					1	2	2	3	3	4
G	32									0	1					1	2	2	3	3	4	5	6
H	50							0	1					1	2	2	3	3	4	5	6	7	8
J	80					0	1					1	2	2	3	3	4	5	6	7	8	10	11
K	125			0	1					1	2	2	3	3	4	5	6	7	8	10	11	14	15
L	200	0	1					1	2	2	3	3	4	5	6	7	8	10	11	14	15	21	22
M	315					1	2	2	3	3	4	5	6	7	8	10	11	14	15	21	22		
N	500			1	2	2	3	3	4	5	6	7	8	10	11	14	15	21	22				
P	800	1	2	2	3	3	4	5	6	7	8	10	11	14	15	21	22						
Q	1250	2	3	3	4	5	6	7	8	10	11	14	15	21	22								
R	2000	3	4	5	6	7	8	10	11	14	15	21	22										

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Proposals for further discussion

1. **Product Specification(s) for LNs**
   - **Workmanship and Appearance** *(adoption of or development of UNICEF defect definition for LN)*
2. **Apply Precision to Tolerance P/T Ratio in evaluating fitness of test method for Quality control purpose.**
3. **Develop guidance / tool kits on application of ISO 2859 and ISO 3951 as an annex of WHO Guidelines for Procuring Public Health Pesticides**

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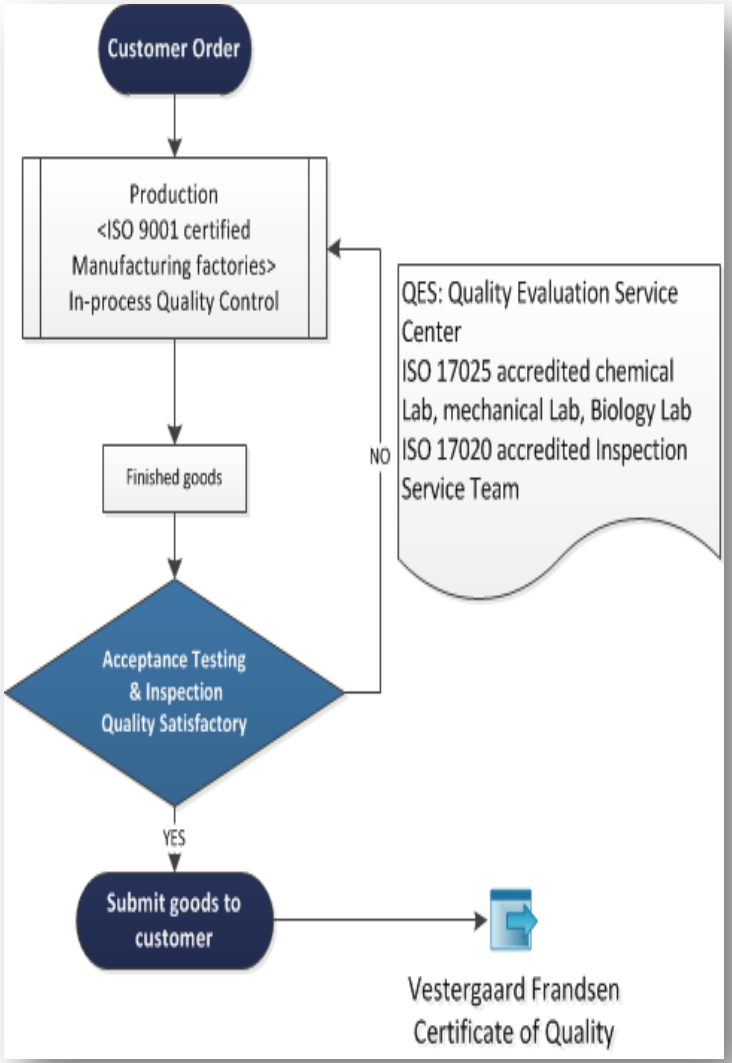
Facts and Figures for PermaNet 2.0 and 3.0

1. Standardized:
   - Manufacturing ISO 9001 certified
   - Laboratories ISO 17025 accredited (2009)
   - Inspection service ISO 17020 accredited (2012)
2. QA testing on 100% shipment as per ISO 2859 & ISO 3951



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Measure the right indicators, and measure them well

A good measure:	Description:
Is quantitative	The measure can be expressed as an objective value
Is easy to understand	The measure conveys at a glance what it is measuring, and how it is derived
Encourages appropriate behavior	The measure is balanced to reward productive behavior and discourage “game playing”
Is visible	The effects of the measure are readily apparent to all involved in the process being measured
Is defined and mutually understood	**The measure has been defined by and/or agreed to by all key process participants (internally and externally)**
Encompasses both outputs and inputs	The measure integrates factors from all aspects of the process measured
Measures only what is important	**The measure focuses on a key performance indicator that is of real value to managing the process & product**
Is multidimensional	The measure is properly balanced between utilization, productivity, and performance, and shows the trade-offs
Uses economies of effort	The benefits of the measure outweigh the costs of collection and analysis
Facilitates trust	**The measure validates the participation among the various parties**

Keebler (1999)

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